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Feeding the Milking Herd

Cooperative Extension South Dakota State University

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FS 582

Feeding the Milking Herd

Cooperative Extension Service
U. S. Department of Agriculture
South Dakota State University

Feeding the Milking Herd

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The goal of most dairymen is to economically produce milk to the cow's highest inherited capacity. To do this, there are at least five essentials: (1) high genetic potential for milk production, (2) healthy cows, (3) proper milking techniques, (4) good quality feed, and (5) sufficient quantities of feed. If any one of these factors is not met, production is reduced. This publication will consider quality and quantity of feeds.

To be profitable, dairy cattle must receive an abundance of palatable feed containing adequate amounts of nutrients in the correct proportion. Certain standards have been developed through years of research to aid in establishing the nutrient needs of dairy cattle. Standards indicate the nutrient need of one animal for one day. When the requirements are known, the amount and kind of feeds to meet these needs can be determined. The daily nutrient requirements of dairy cattle are given in table 1. The total ration must supply sufficient nutrients for the cow's body maintenance, milk production, reproduction, and growth.

Information on the *average* nutrient composition of feedstuffs common to South Dakota dairymen is listed in table 2. These table values are needed to provide approximate protein, energy, and mineral values of feedstuffs when not available from individual sample analysis. Although animal requirements and feed composition for calcium and phosphorus generally are not calculated to precise accuracy, these values are provided for an estimation of the calcium-phosphorus ratio. Refer to FS 585 entitled "Supplying Minerals and Vitamins for Milk Production" for a more detailed discussion of mineral needs.

Table 1. Daily nutrient requirements of dairy cattle.

	Crude Protein	Net Energy	Calcium	Phosphorus
	lb.	therms	lb.	lb.
A. Maintenance[1] (per head dairy)				
800 lb. cow	1.04	6.9	.034	.026
1,000 lb. cow	1.30	8.3	.040	.031
1,200 lb. cow	1.51	9.5	.046	.035
1,400 lb. cow	1.67	10.7	.050	.039
1,600 lb. cow	1.86	11.8	.056	.043
[1]Add 20% to these requirements for first calf heifers and 10% for second calf heifers.				
B. Milk Production (per lb. of milk) Add to maintenance allowance				
% butterfat				
3.0	.070	.290	.0025	.0018
3.5	.074	.314	.0026	.0019
4.0	.078	.336	.0027	.0020
4.5	.082	.354	.0028	.0021
5.0	.086	.377	.0029	.0022
5.5	.090	.400	.0030	.0023
C. Maintenance + Pregnancy (last 2 mo. of gestation)				
800 lb. cow	1.30	8.8	.046	.036
1,000 lb. cow	1.62	10.8	.058	.044
1,200 lb. cow	1.86	12.5	.068	.052
1,400 lb. cow	2.07	14.1	.078	.060
1,600 lb. cow	2.31	15.7	.090	.068
D. Growth				
To allow for growth, add 20 percent to the maintenance allowance during the first lactation and 10 percent during the second lactation for all required nutrients. Example: 1,200 pound first calf heifer requirement of 1.51 pounds. To provide for growth add 20%, (1.51 x .20 = .30) 1.51 + .30 = 1.81 pound protein required.				

Table 2. Average composition of feeds.

	Dry matter	Crude protein	Net energy	Calcium	Phosphorus
	% as fed	% as fed	therms/lb	% as fed	
Dry Forages:					
Alfalfa hay					
(Early bloom)	90	18.0	.50	1.25	.22
(Mid-bloom	90	15.0	.46	1.25	.22
(Full bloom)	90	12.0	.42	1.25	.22
Alfalfa-brome hay					
(Early cut)	90	15.0	.50	1.30	.33
(Late cut)	90	12.0	.46	1.30	.33
Red clover hay					
(Early cut)	90	17.0	.50	2.02	.35
(Late cut)	90	12.0	.46	1.00	.25
Prairie hay	90	7.0	.40	0.30	.20
Silages:					
Alfalfa, wilted					
(Early bloom)	45	9.0	.25	0.62	.11
(Mid-bloom)	45	7.5	.24	0.62	.11
(Full bloom)	45	6.0	.22	0.62	.07
Corn	30	2.5	.22	0.29	.07
Oats, wilted					
(Boot)	45	8.0	.24	0.17	.14
(Milk)	45	6.5	.23	0.17	.14
(Dough)	45	5.5	.20	0.17	.14
Sorghum	30	2.3	.19	0.10	.07
Grains and Concentrates:					
Barley	90	12.0	.80	0.09	.43
Corn and cob meal	90	7.5	.75	0.05	.28
Corn, shelled	90	9.0	.80	0.02	.32
Linseed meal	90	36.0	.85	0.40	.82
Milo	90	10.0	.78	0.05	.32
Oats	90	11.0	.73	0.10	.35
Soybean meal	90	44.0	.85	0.25	.60
Soybeans	90	37.0	.90	0.24	.58
Wheat	90	13.0	.80	0.05	.37

The procedure to calcuate the daily nutrient needs and to meet these needs is presented in the work sheet in table 3. A work sheet is also provided for each dairyman's use. Information from tables 1 and 2 is used in determining and meeting the dairy cow's needs as presented in table 3.

In section A of table 3, the daily nutrient requirements of a 1,400 pound non-pregnant cow producing 60 pounds of milk containing 3.5% fat are determined. These values were determined using the information from table 1. The maintenance requirements for a 1,400 pound cow are found in table 1, section A. Milk production requirements per pound of milk are found in table 1, section B. Adding the nutrients required for maintenance and milk production, the total daily requirements are determined.

In section B of table 3, the nutrients provided from the forage are first calculated. With average quality forage, a dairy cow will normally consume about 2 pounds of air dry forage per hundred pounds of body weight when fed free choice. With good quality forage, cows may eat 2½ pounds of air dry forage per hundred pounds of body weight. With poor quality forage, cows will usually eat less forage.

In the above example, average quality hay and corn silage are offered free choice. This means the 1,400 pound cow will consume equal amounts of hay and corn silage on an air dry basis, or a total of two pounds of forage dry matter per 100 pounds of body weight.

Table 3. Calculating daily nutrient requirements of dairy cows.

	Crude Protein (lb.)	Net Energy (therms)
A. Daily Requirements for a Dairy Cow:		
1. For **Maintenance,** body weight **1400** lbs.	1.67	10.7
2. For **60 Milk** lbs/day @ 3.5% fat:		
60 lbs. milk x .074 CP. lb. milk =		
	4.44	
60 lbs. milk x .314 NE/lb. milk =		18.8
Total daily requirements (sum)	6.11	29.5
B. Nutrients Provided by Daily Ration:		
1. Forage:		
14 lbs. of **alfalfa hay @ 15% CP**	2.10	
14 lbs. of alfalfa hay @ **.46 therms/lb.**		6.4
40 lbs. of **corn silage @ 2.5% CP**	1.00	
40 lbs. of **corn silage @ .22 therms /lb.**		8.8
Total nutrients from forage	3.01	15.2
Nutrients needed from grain mixture	3.10	14.3
2. Grain mixture:		
20 lbs. that contains **16%** CP	3.20	
20 lbs. that contains **.80** therms NE/lb.		16.0
Total nutrients from daily ration	6.30	31.2

Table 4. Calculating daily nutrient requirements of dairy cows

	Crude Protein (lb.)	Net Energy (therms)
A. Daily Requirements for Dairy Cows:		
1. For ____, body weight ____lbs.		
2. For ____lbs/day @ ____fat %:		
____ lbs. milk x ____ CP. lb. milk =		
____ lbs. milk x ____ NE/lb. milk =		
Total daily requirements (sum)		
B. Nutrients Provided by Daily Ration:		
1. Forage:		
____lbs. of ____		
____lbs. of ____		
____lbs. of ____		
____lbs. of ____		
Total nutrients from forage		
Nutrients needed from grain mixture		
2. Grain mixture:		
____lbs. that contains ____CP		
____lbs. that contains ____therms NE/lb.		
Total nutrients from daily ration		

To determine how much corn silage dry matter the cow is consuming, the corn silage must be converted from 30% dry matter (as fed basis) to an air dry basis (90% dry matter). Three pounds of corn silage (30% dry matter) has the same dry matter as one pound of hay. Therefore, 40 pounds of wet corn silage provides 13 to 14 pounds of air dry corn silage. Therefore, the cow is consuming one pound of corn silage dry matter and one pound of hay dry matter per 100 pounds body weight, or a total of 2 pounds of forage dry matter per 100 pounds body weight. The total forage consumption for this 1,400 pound cow is then 14 pounds of hay and 40 pounds of wet corn silage.

Next, the amount of nutrients which need to be supplied from the grain mixture are determined (table 3, section B). According to the recommended grain feeding rates, a cow producing 60 pounds of milk should be fed grain at the rate of 1 pound per 3 pounds of milk, thus 20 pounds of grain needs to be fed per day. A more detailed discussion of grain feeding guidelines is presented in FS 584 entitled "Supplying Energy for Milk Production."

The 16% protein grain ration is required when legume and corn silage are the major forages fed. Most grain rations will contain about .80 therms per pound, therefore this value was used in the energy calculations in section B. In our example, the cow is fed a forage program of legume and corn silage which requires a 16% crude protein grain mixture. For further

information on formulating grain rations to meet protein needs, ask for FS 583 entitled "Supplying Protein for Milk Production."

When comparing total nutrients consumed to total daily requirements (table 3), it is evident that the protein needs (6.30 lb. eaten *vs* 6.11 lb. required) and the energy needs (31.4 therms eaten *vs* 29.5 therms required) have been met by feeding forage free choice and grain according to recommended guidelines. By following the guidelines for grain feeding and protein percent described in FS 583 and FS 584, a dairyman will normally meet the protein and energy requirements of each cow and can expect maximum production and profit from each of his dairy cows.

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